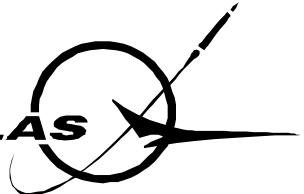


MCDONNELL DOUGLAS



AIR-4.1.2
AV-8B HARRIER CLASS DESK

Open Systems Ada Technology Demo

Open Systems-Joint Task Force

WALCOFF AUDITORIUM

29 May 1996
FAIRFAX VA

Maj. Glenn Hoppe

AV-8B CLASS DESK

Don Winter

MCDONNELL DOUGLAS AEROSPACE



OUTLINE



AIR-4.1.2
AV-8B HARRIER CLASS DESK

→ BACKGROUND

- TECHNICAL DETAILS
- FY97 RECOMMENDATIONS
- SUMMARY



BACKGROUND

AIR-4.1.2
AV-8B HARRIER CLASS DESK

GENERAL PROBLEM:

- Use of COTS is growing in military embedded applications
- Ada 95 is language of choice where COTS/GOTS can't be applied
- Mixed language situations may arise as a result
- Risk reduction demonstrations are called for, employing Ada 95 in COTS RT environment (POSIX, C)

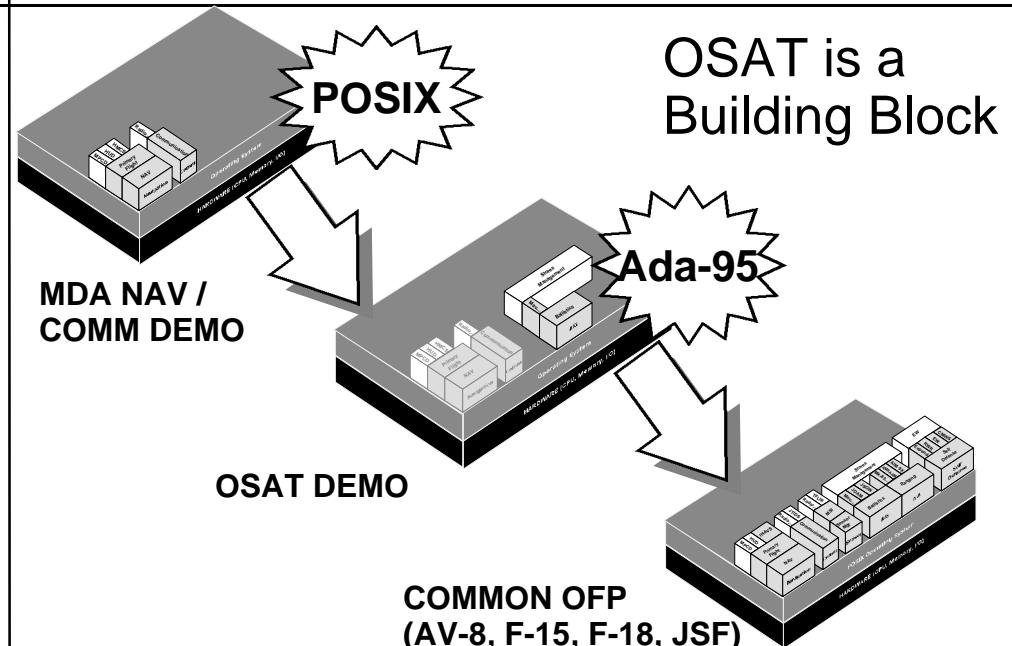
SOLUTION:

McDonnell Douglas Aerospace will:

- Develop an air-to-ground ballistics algorithm using Ada 95
- Link this algorithm into the AV-8B demonstration OFP (C, C++)
- Perform a flight demonstration on an AV-8B equipped with COTS MC, POSIX-compliant RTOS
- Apply/evaluate Wright Lab DFIP

BENEFICIARIES:

- AV-8B OSCAR
- F-15 MPDP Upgrade
- F/A-18 Blk 18E
- C-17 CIP
- Joint Strike Fighter



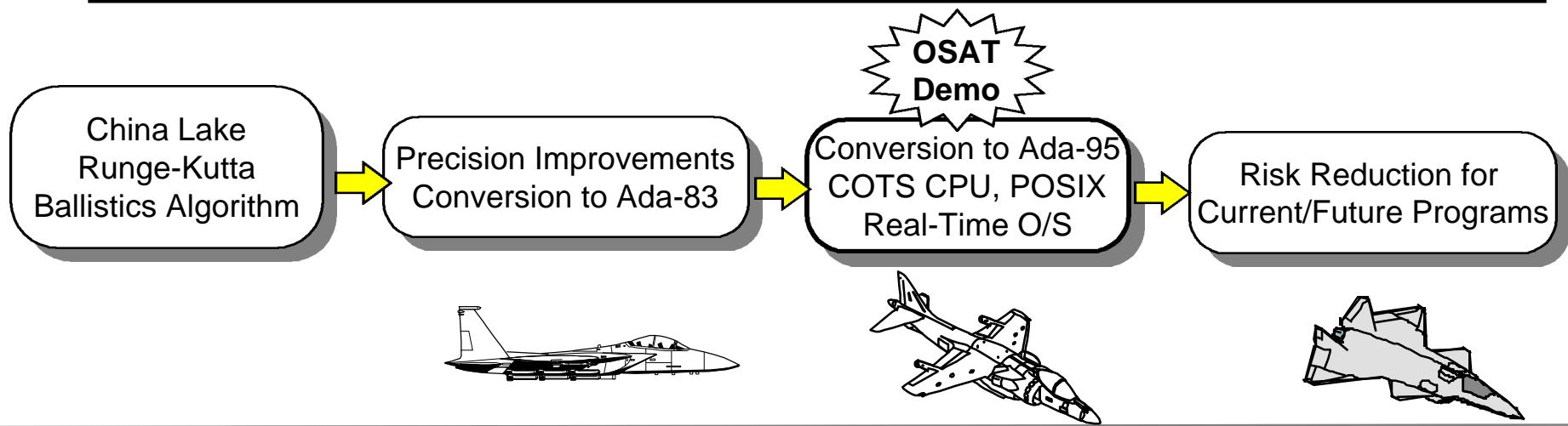


PROJECT OVERVIEW



AIR-4.1.2
AV-8B HARRIER CLASS DESK

OPEN SYSTEMS ADA TECHNOLOGY DEMONSTRATION



- **RE-ENGINEERED F-15 RUNGE-KUTTA ALGORITHM**
 - ADA 95, OBJECT-ORIENTED DESIGN
 - DFIP FAULT TOLERANT INPUT/OUTPUT PROCESSING
- **COTS RUN-TIME ENVIRONMENT**
 - POWER PC MISSION COMPUTER
 - POSIX-COMPLIANT OPERATING SYSTEM (VX WORKS)



OUTLINE



AIR-4.1.2
AV-8B HARRIER CLASS DESK

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OSAT DEMONSTRATION



AIR-4.1.2
AV-8B HARRIER CLASS DESK

Software Development Tasks

- Reengineer/recode F-15 Runge-Kutta (Ada83) ballistics algorithm
 - Object-oriented design in accordance with MDA Common OFP architecture
 - Code in Ada95
 - POSIX-compliant RTOS (VX Works)
 - PowerPC host
 - Implement DFIP input and output algorithms
- Integrate with AV-8B demo (C) OFP, C++ NAV module
 - Enhance demo OFP to add A/G
 - Transform to/from platform coordinates
 - Accommodate 20 Hz algorithm (legacy code is 10 Hz)
 - Hard code Mk 76 Practice Bomb ballistics



DEMONSTRATION ENVIRONMENT



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AV-8B HARRIER CLASS DESK

- TAV-8 CUM 6 WILL BE DEMONSTRATOR AIRCRAFT
 - BASED AT NAWC-CL
- XN-6 MISSION COMPUTER WILL BE REPLACED WITH POWER PC-BASED UNIT
 - SUPPLIED BY CDI
- WIND RIVER VX WORKS RTOS (POSIX-COMPLIANT)
- BASELINE OFP WILL BE MDA C-OFP WITH C++ COMMON NAV/COMM MODULES (USED FOR MDA DEMO FLIGHT)
- GREEN HILLS ADA 95 NATIVE AND CROSS COMPILERS
- FLIGHTS WILL BE CONDUCTED AT CHINA LAKE
 - MK 76 DROPS WILL OCCUR AT CHINA LAKE'S TEST RANGE



OUTLINE



AIR-4.1.2
AV-8B HARRIER CLASS DESK

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OUTLINE



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PROJECT SCHEDULE



AIR-4.1.2
AV-8B HARRIER CLASS DESK

ID	Task Name	1995				1996				1997				1998				1999		
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3
1	COFP																			
2	Define and Acquire OO Toolset																			
3	Achieve proficiency with new toolset																			
4	Requirements Tool Decision									◆ 6/3										
5	Architecture Development																			
6	Initial Mission Computer (MC) Arch. Review								◆ 5/8											
7	Detailed Arch. Review - A/A & A/G wpn, NAV pt/pt								◆ 7/3											
8	Detailed Arch. Review - all Common MDA MC S/W									◆ 10/2										
9	Navigation																			
10	Point to Point Steering																			
11	A/G Weapons (Targeting/Steering/Zones)																			
12	Ballistic																			
13	Gun									◆ 12/31										
14	Rockets (OSCAR)										◆ 3/3									
15	Maverick										◆ 6/2									
16	GBU-10/12/24/28 (Laser)										◆ 7/1									
17	GBU-15 (TV/IR)										◆ 7/1									



AIR-4.1.2
AV-8B HARRIER CLASS DESK

FY97 RECOMMENDATIONS

- COMPLETE ALL OSAT DEMO OBJECTIVES (\$200K REQ'D)
- OSAT FOLLOW-ON CANDIDATES:
 - DISTRIBUTED PROCESSING DEMONSTRATION (MULTIPLE POWER PCs)
 - POSIX/ORB/ADA 95
 - IMPLEMENT/DEMONSTRATE F-15 ZAP MISSILE ALGORITHM
 - 5-DOF MISSILE FLY-OUT ALGORITHM
 - REDESIGN USING ADA 95, OBJECT-ORIENTED DESIGN
 - DEMONSTRATE OFF-BOARD LINK PROCESSING
 - AUTOMATIC TARGET HAND-OFF SYSTEM (ATHS)
 - ELEMENT OF MULTI-SENSOR INTEGRATION
 - IMPLEMENT/DEMONSTRATE OTHER COMMON OFP COMPONENTS USING ADA 95

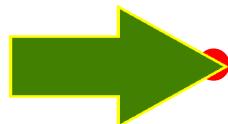


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SUMMARY



AIR-4.1.2
AV-8B HARRIER CLASS DESK

- OSAT BUILDS UPON MDA'S COMMON OFP IRAD AND OFFERS REAL RISK MITIGATION
 - BENEFICIARIES INCLUDE ALL AVIONICS PROGRAMS EVOLVING TOWARD OPEN SYSTEMS AND/OR ADA 95
- DFIP ANALYSIS AND TEST HAS IMMEDIATE PAYBACK POSSIBILITIES
 - ENHANCEMENT TO COMMON BALLISTICS MODULE TARGETED FOR AV-8B, F-15, F/A-18, JSF
- FY97 FOLLOW-ON OBJECTIVES SHOULD ADDRESS OTHER KEY RISK AREAS
 - DISTRIBUTED PROCESSING
 - NEW FUNCTIONALITY (E.G. OFF-BOARD DATA)